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A NEW EASY WAY TO CONTROL POCKET GOPHERS

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THE ALBERTA DEPARTMENT OF AGRICULTURE

PROVINCE OF ALBERTA

CONTROL OF POCKET GOPHERS

Prepared by:

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ALBERTA DEPARTMENT OF AGRICULTURE

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Pocket gophers . . . ,

prairie gophers . . . ,

moles . . . ,

WHO'S WHO??

Pocket gophers, often mistakenly called moles, are a common pest in Alberta. Although pocket gophers are rodents, they belong to a different family of rodents than the ground squirrels and should not be confused with the **Richardson's ground squirrels** (or prairie gophers as they are sometimes called). True moles, on the other hand, are not rodents; they belong to an entirely different order, the Insectivora. Their habits and food are different from those of pocket gophers, as are the methods for their control.

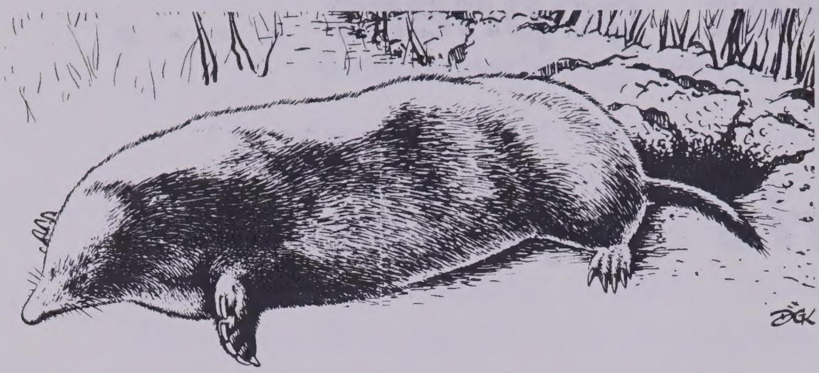


Fig. 1:
The mole **(Scalopus aquaticus)**, is not found in Alberta.

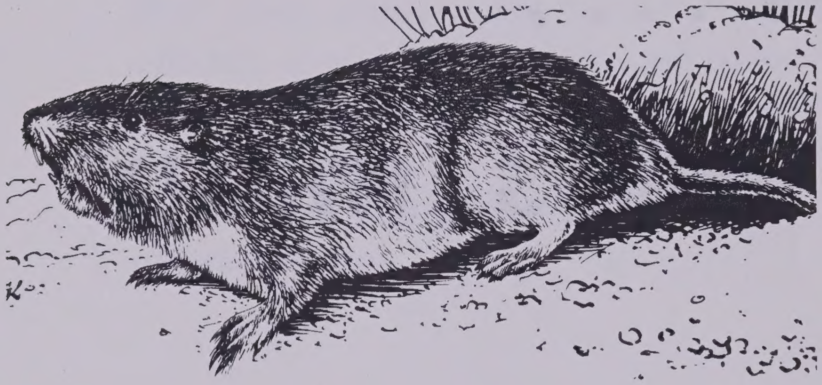


Fig. 2:
The pocket gopher **(Thomomys talpoides)**, is common in Alberta and, in the process of burrowing, builds mounds very similar to mounds produced by the eastern mole.

True moles are not present in Alberta, whereas pocket gophers cause extensive damage to crops and machinery each year. It is estimated that one pocket gopher will excavate about a ton of earth in one season and consume a considerable amount of vegetation each day. The impact of this amount of activity on the agricultural economy in many areas of Alberta is understandably substantial.

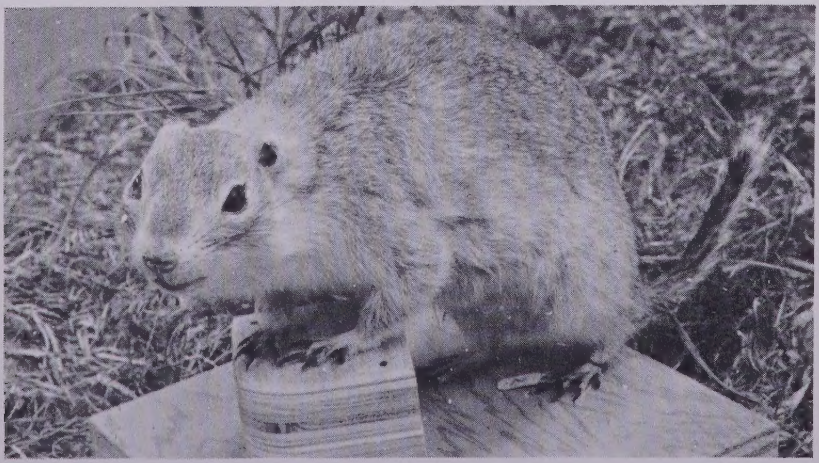


Fig. 3:
The Richardson's Ground Squirrel **(Spermophilus richardsonii)** or prairie gopher, is a common rodent in Alberta.

POCKET GOPHER:

CHARACTERISTICS:

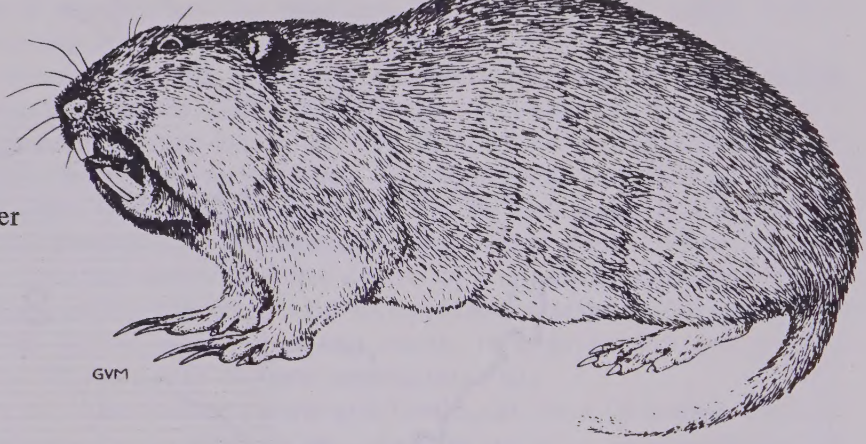


Fig. 4:
The pocket gopher
(genus Thomomys).

Pocket gophers (genus **Thomomys**) are burrowing rodents, seven to nine inches long, with short legs and stout bodies. Three long claws on each forefoot, fairly small eyes set far apart and high up on the head, and small ears are also convenient adaptations for a life in underground burrows. The blunt head has two pair of exposed chisel-like incisor teeth for gnawing vegetation, and digging. The lips encircle these continuous growing incisors in such a manner that they are still exposed even when the mouth is closed. This adaptation enables the pocket gopher to cut roots or dig burrows without, at the same time, "eating" dirt.

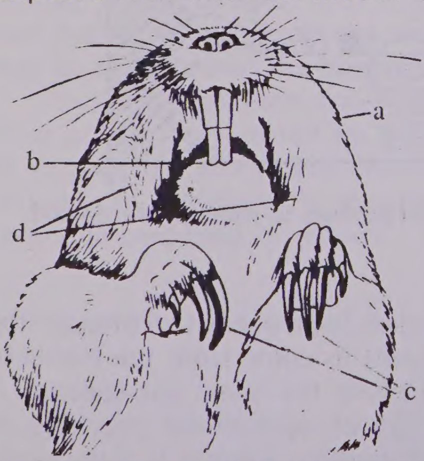


Fig. 5: The digging adaptations of the pocket gopher:

(a) a short-blunt head
(b) exposed incisor teeth.
(c) long forelimb claws.
(d) fur-lined cheek pouches.

Mouth incisors and forelimb claws grow an amazing amount each year to compensate for continuous wear. The pocket gopher gets the first part of its name from a pair of external, fur-lined cheek pouches which are used for carrying food and nesting material, but not for removing dirt. The tail is short and scantily covered with a few guard hairs. There is a sparse scattering of long guard hairs over the rest of the body, particularly in the rump region. They presumably serve as sensory hairs that, along with the nearly naked tail, guide gophers in their dark tunnel systems, especially when going backward. Pocket gophers vary in color slightly from a greyish-brown where they occur in the central parts of the province to a light brown in the Medicine Hat-Cypress Hills region.

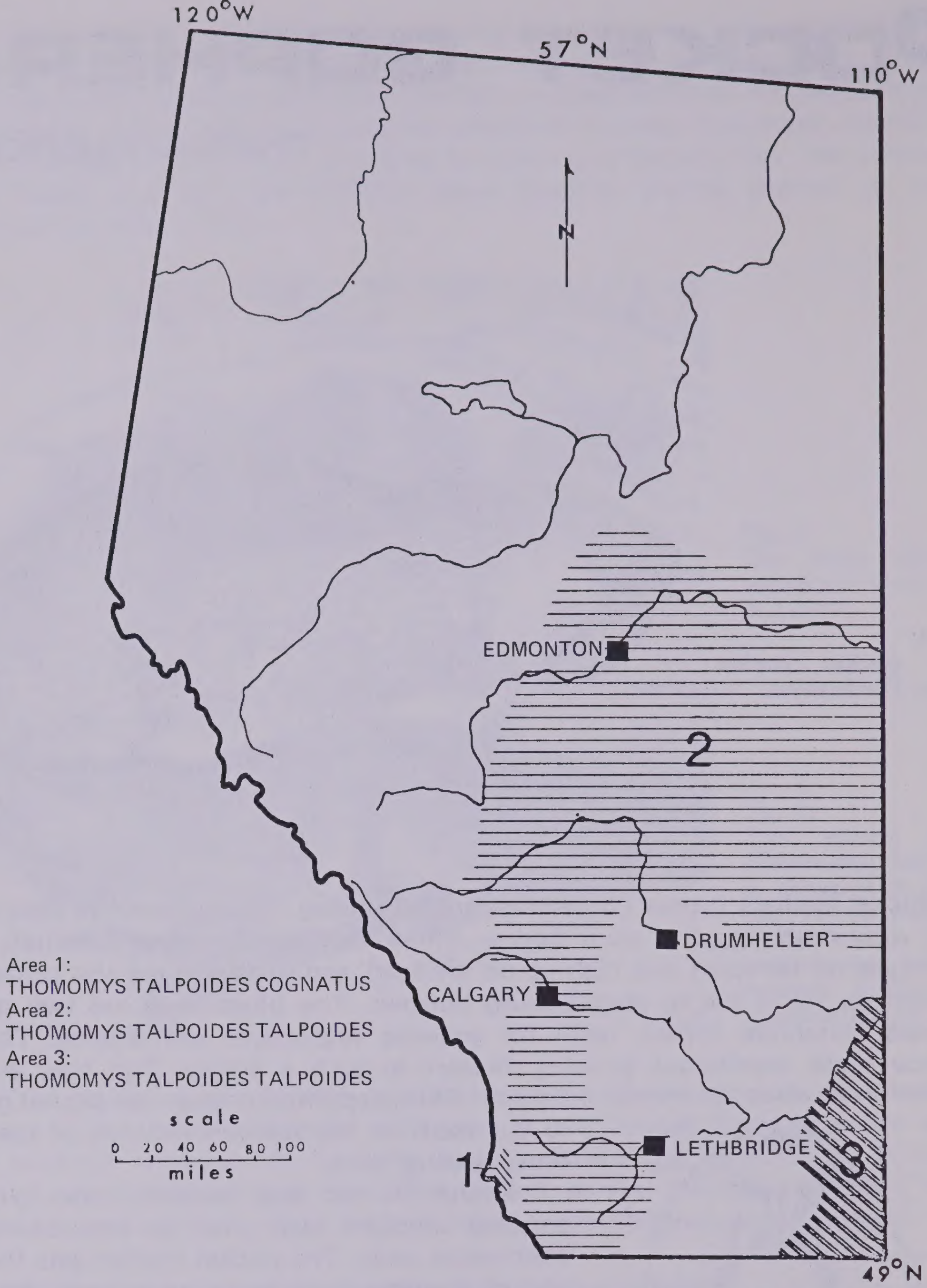


Fig. 6: Species and sub-species distribution of pocket gophers in Alberta (Macdonald, 1969):

DISTRIBUTION:

In Alberta, at least two sub-species of the pocket gopher exist. Although the Medicine Hat-Cypress Hills gopher is slightly different in color from the northern plains pocket gopher, they are believed to represent the same sub-species. A Geographical Isolation of the two may be a result of agricultural practices. A population from the Crowsnest Pass area of south-western Alberta is a distinctly different sub-species and is believed to have migrated recently from British Columbia. The Crowsnest Pass animals are different in pelage color, number of mammae (four pair of "teats"), and are smaller in overall size. Present evidence indicates that this sub-species is expanding its range eastward at a rate of about one mile per year.

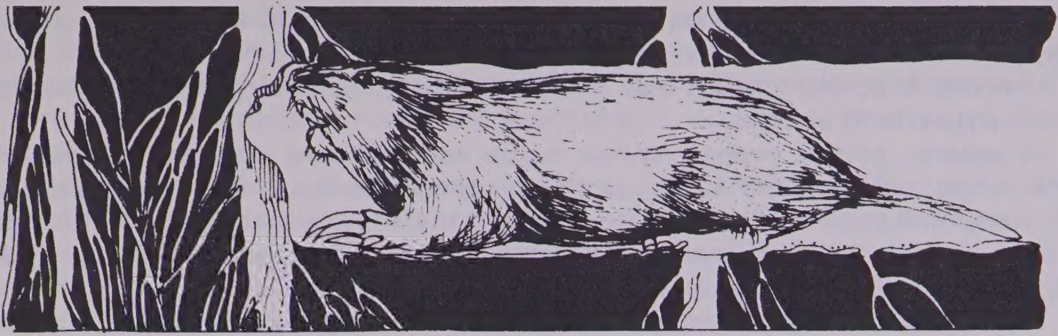


Fig. 7: Pocket gophers damage forage, cereal crops and vegetables by feeding exclusively on roots and vegetable matter beneath the soil surface.

DAMAGE:

In some cases pocket gopher activity may be beneficial to the land by providing increased aeration and penetration by moisture. However, in hay fields, lawns, gardens and crops they are undoubtedly a serious pest.

Pocket gophers seriously reduce production in field crops and gardens through their feeding and tunnelling habits. One pocket gopher will excavate about a ton of earth in one season and build from thirty to fifty mounds of earth up to one foot high and fifteen to twenty inches in diameter. This renders a considerable amount of a hay crop inaccessible for cutting or grazing. The surface mounds are a costly hazard to mowing equipment in hay meadows and alfalfa fields. They damage cereal and hay crops also by destroying the crown of the plants and also destroy some vegetables. Pocket gophers feed strictly on vegetable matter in the soil with a definite preference for tubers, corms and tap roots. It is estimated one pocket gopher consumes about four pounds of fresh vegetation a day.

In irrigated areas, burrows in the canals and banks can lead to breaks through which water may leak. Water seepage in an area may actually encourage pocket gopher infestations since the excess soil moisture makes burrowing easier. Pocket gophers are also a menace around oil storage tank depots when they burrow holes in the earthen walls of the large collecting moats which surround the storage tanks.

Alfalfa fields are ideal for a pocket gopher's existence. The soil is usually deep, light and well drained. A sign of a pocket gopher infestation in alfalfa is a condition that looks like wilt, caused, however, by the tap root of the plant being eaten through about three or four inches below the surface. In gardens, the tops of plants may appear wilted or, in the case of carrots, beets and some bulbs, the entire plant may be pulled down the burrows.

Pocket gophers are also a serious threat to good weed control practices. Weed seeds can be transported by gophers directly but more often weeds are encouraged to spread to areas where desirable plants have been eliminated by pocket gopher activity. In addition to smothering productive hay, the gopher mounds provide favorable seed beds for weeds.

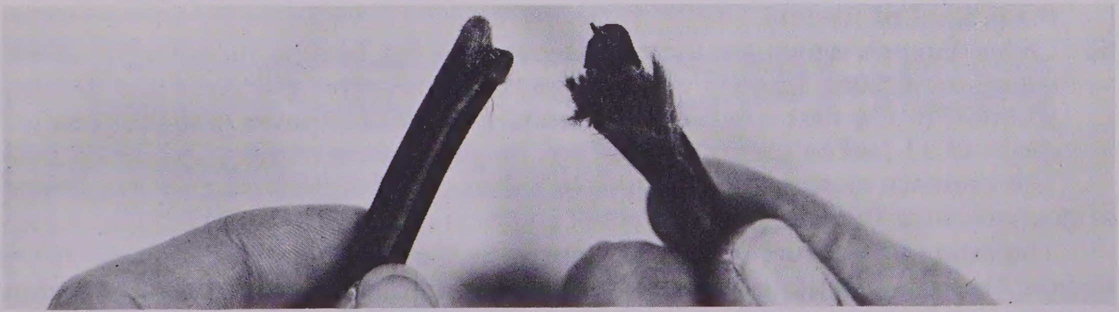


Fig. 8: Damage done to underground utility cables by burrow pocket gophers is difficult to locate and costly to repair.

Pocket gophers also cause extensive damage to public utilities by cutting underground drains and electric cables.

In orchards pocket gophers may do considerable damage by cutting and feeding on the root systems of trees.

In general, pocket gophers appear to be less abundant on sheep ranges than cattle ranges, which might be influenced by the similarity in food preferences of both sheep and pocket gophers. However, since there is direct competition for food between sheep and pocket gophers, it might be that pocket gophers damage sheep ranges as much or more than they do cattle ranges.

The saving on crop and wear and tear on machinery repays ten-fold the time and cost of a well executed pocket gopher control operation.

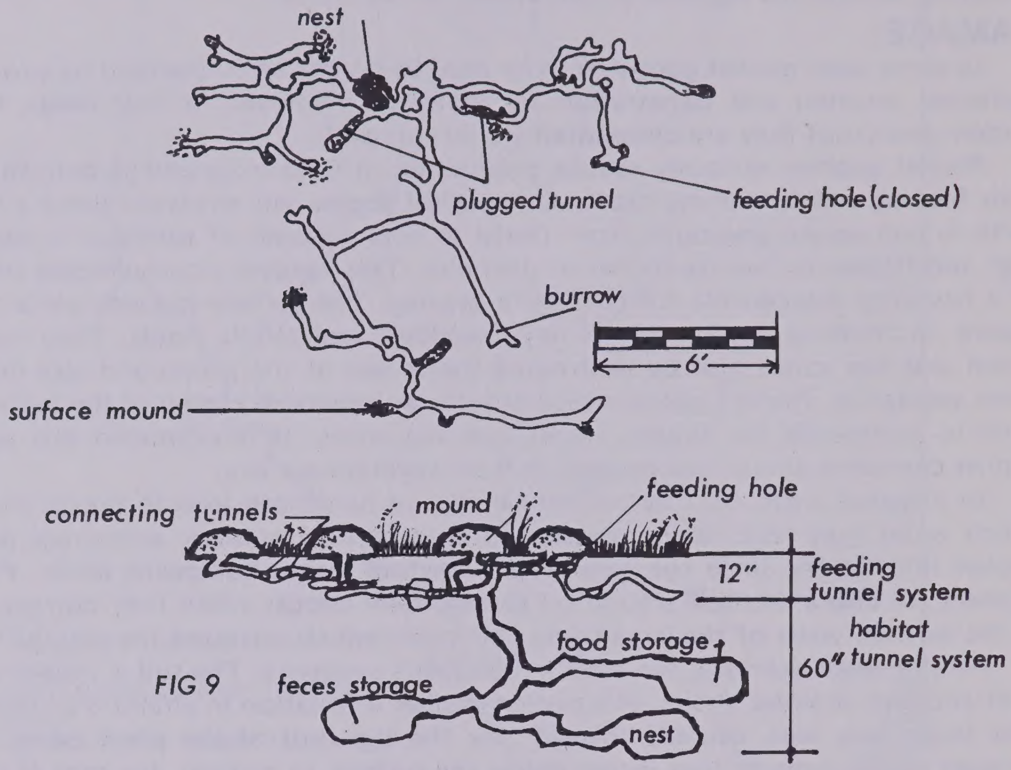


Fig. 9: The pocket gopher's burrow system.

POCKET GOPHER BEHAVIOR:

Pocket gopher tunnels which are about two inches in diameter may extend underground, parallel with the ground surface, for hundreds of feet depending on the texture and condition of the soil. The tunnel system is made up of two types of tunnels:

a) **Feeding Tunnels** which are 3" — 10" from the surface and are used and dug in the process of feeding.

b) **Living Tunnels** which are located deeper than the feeding tunnels (20" to 80" below the ground surface) and contain storage chambers for food and feces in addition to the nest itself. Pocket gophers have been known to dig tunnels to a depth of 11 feet below ground surface.

The presence of numerous mounds in a field does not indicate a similar number of gophers since these animals live alone and each push up 30 to 50 mounds a year.

The mounding occurs mainly at night with the dug earth being pushed to the surface through short lateral tunnels. The peaks in digging activity in late evening and early dawn represents the times when gophers are most active in pushing soil to the surface of the ground, but not necessarily when gophers are most active. Both the front claws and the upper incisors are used in digging. Soil loosened is pushed back under the animals' body. Periodically it will turn around and push the loose soil to the surface with the front feet and nose. The pattern of the resulting rounded mound usually indicates the approximate location of the "plugged" main tunnel.

Gophers are most active in early summer and fall and become less active after a drought or after a heavy rain. Cool weather stimulates feeding activity. In winter and the heat of the summer these rodents retire to the deeper parts of their burrows and are less active at the surface. During periods of inactivity the animals subsist on food stored in the food chambers. Pocket gophers do not hibernate.

During the winter months, pocket gophers tend to burrow under the snow but above the surface of the ground. During this time dirt from their underground burrows is pushed into the snow tunnels giving rise to the rope-like castings seen after the snow melts.

Despite their subterranean existence pocket gophers are surprisingly meticulous in their personal habits. Any food substances which are wet or dirty are cleaned and dried before eating. Pocket gophers will stop digging intermittently to clean the large incisors with the forelimb claws. Grooming of the coat, forelimbs and cheek pouches occurs frequently.

The food habits of the different sex and age classes of pocket gophers differ slightly. Young animals eat significantly more above-ground vegetation than do adults. Adults consume proportionately greater amounts of forbs than grass even when equal amounts of both are available.

Pocket gophers are decidedly unsocial. The home range of a pocket gopher is also its "territory", for adults vigorously defend their entire burrow system from individuals of both sexes. Except for a short time when the young are in the mother's burrow and when mating takes place, any burrow system is occupied by only one animal. When two adults are placed together they fight viciously. Once a gopher has established a territory, it usually remains there for the rest of its life except for minor boundary shifts. Male territories occupy an area of approximately 2,700 square feet, whereas, female territories, on the average are about half that size.

The breeding season for pocket gophers is May and June and often coincides with the availability of green forage. Litters of 5 - 6 young are born once a year, following a gestation period of 30 - 40 days. The young remain in the nest for several weeks before leaving the parent tunnel to wander overland and start their own tunnels in new places. Although the sex ratio between males and females is equal at birth, females are definitely more predominant in older age classes. This is due to the fact that the female life expectancy of 3-4 years is considerably longer than the life expectancy for male pocket gophers.

Pocket gophers are known to host several types of parasites. Among the most common are mites, fleas, ticks, round worms, tapeworms and occasionally warbles.

POCKET GOPHER CONTROL

FOR ALBERTA

It is possible to control and even eliminate gophers over a large area. The best time to begin control is during the period immediately after mounding activity starts in the spring, and before the young are born. Although trapping and poisoning are the most commonly used methods in Alberta, there are several direct and indirect methods of control which are often very effective.

INDIRECT METHODS OF POCKET GOPHER CONTROL

VIA FARM MANAGEMENT PRACTICES:

Land use practices that control vegetation, soil conditions and water drainage have important effects on pocket gopher populations.

1) **Hay Crop Varieties:**
   Alfalfa commonly supports greater numbers of pocket gophers than any other crop in Alberta. Certain varieties of alfalfa (i.e. Rambler, Romer) have several large roots instead of a single big tap root. These varieties suffer less from pocket gopher damage than the single tap-rooted varieties, for the above reason.

2) **Irrigation:**
   Where irrigation is available, periodic and systematic flooding of hay fields can be effective in limiting the abundance of pocket gophers. Water which accumulates regularly in their burrow systems will force pocket gophers to high ground where they can be reduced in numbers by predators. Leveling of unnecessarily high ground in the field will make this type of control more effective.

3) **Crop Rotation:**
   Cereal crops do not provide enough food year round and are therefore generally inhospitable to pocket gophers. It is possible that strips of land planted to grain crops might be used to keep these animals from moving into alfalfa fields. Alfalfa fields, rendered unproductive by pocket gophers, can be plowed and planted to grain crops. The pocket gophers will be eliminated if the tillage of the field is effective in killing the alfalfa and weeds used as food by pocket gophers.

4) **Chemical Weed Control:**
   Because pocket gophers prefer forbs such as dandelions and other tap-rooted weeds, treatment with 2,4-D is very effective in reducing pocket gopher density by destroying their preferred food supply in grass fields. **(Warning: Do not apply 2,4-D to alfalfa for this purpose without professional advice.)**

5) **Orchard and Shelterbelt Management:**
   Orchards and shelterbelts offer suitable habitat for pocket gophers in many areas where alfalfa and weeds become established between the trees. However, in orchards kept relatively free of weeds and food plants, pocket gophers are often uncommon or absent.

Note: Indirect methods of control are effective because pocket gophers usually do not travel great distances and most gophers will die rather than migrate when their source of food is destroyed by plowing or herbicides.

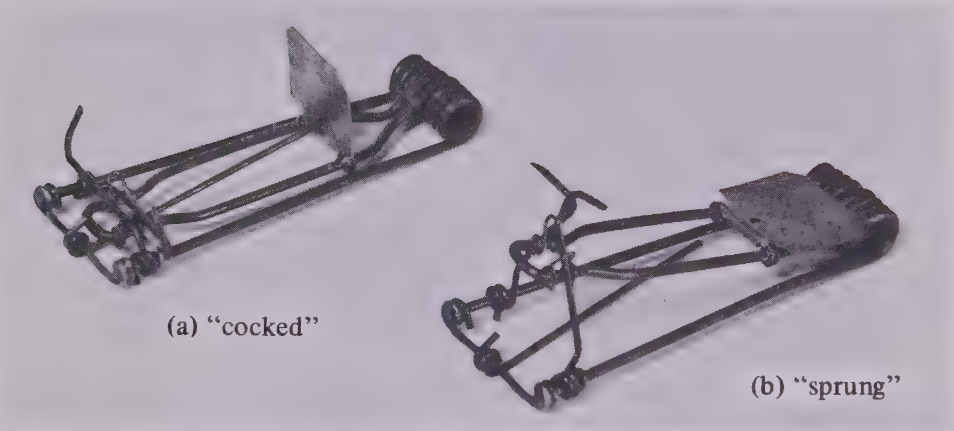
DIRECT METHODS OF POCKET GOPHER CONTROL

1. TRAPPING:

Trapping as a method of control is most effective **during the breeding** season when it is not uncommon to catch more than one pocket gopher in the same burrow. The common spring trap or the special Macabee trap will catch gophers underground.

When using the spring gopher trap, it is necessary to widen the tunnel to allow the steel jaws to lie flat and outstretched. The Macabee trap, however, will fit the burrow opening without disturbing the soil.

Macabee traps can be sprung from only one direction. Therefore, they should always be set in pairs facing outward. The following steps are suggested:


(a) "cocked"

(b) "sprung"

Fig. 10: The Macabee Trap:

1. Locate the newest mound in an area.
2. Probe with sharp object or rod to locate the main runway.
3. Dig down until you locate the runway and remove soil from the burrows so that traps can be placed far back into the tunnels.
4. Attach a piece of wire by running it through the coil spring. Fasten the other end of the wire to a metal stake to serve as an anchor and also to help locate the set for tending, so the gopher cannot pull it into the burrow.

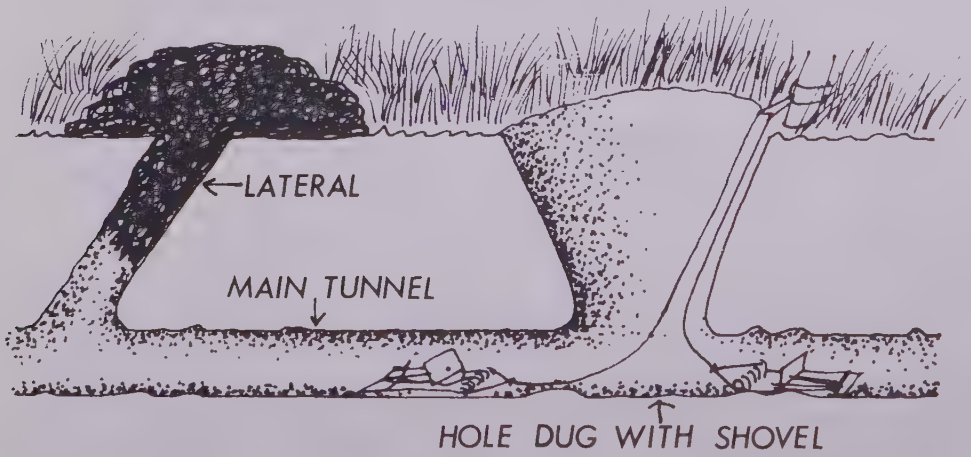


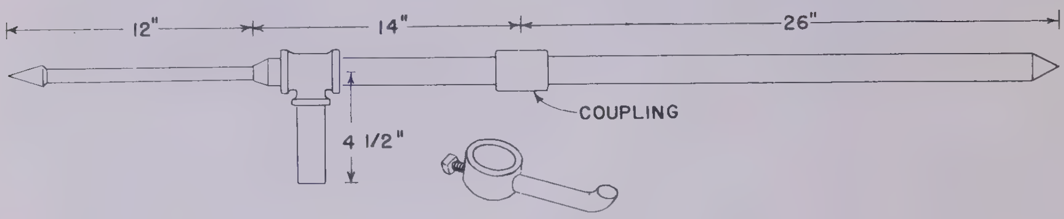
Fig. 11: Lateral view of "the set"

5. Set and place two traps, one in each direction. The trigger (flat metal plate) is placed away from the excavation.
6. The open burrows attract the gopher and he will be caught while trying to plug them. However, if you let in too much light, he may push a large amount of soil ahead of him. This may spring the trap and allow the gopher to escape. Therefore, just partially cover the entrances with pieces of sod.

Note: The common "spring" or "pan" trap can be used but in tests these have proven to be not quite as successful as the Macabee traps. They have a slight disadvantage of requiring more "working room" in the tunnel to function properly. However, provided care is exercised in following the same setting procedures as described for the Macabee trap above, one can expect reasonable success with the standard "spring" or "pan" traps.

2. POISON BAITING BY HAND:

Locate the main runway as described above with a probe. Open the tunnel with a hand trowel and place a tablespoon of grain bait or two or three pieces of the large size carrot chunks in each side of the open gopher burrow. A long-handled spoon is recommended so that bait is placed sufficiently far enough back in the runway so that it will not be covered by dirt when the excavation is filled in.



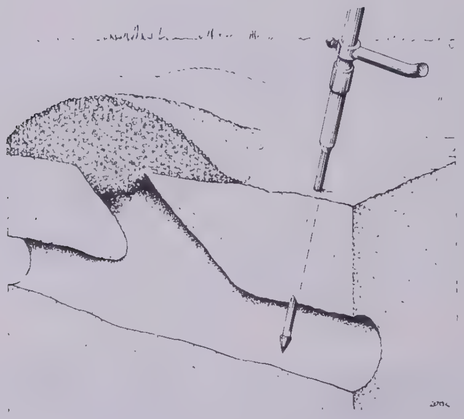


Fig. 12:
Baiting by probe.

3. BAITING BY PROBE:

In moderately large areas the use of a probe and a suitable bait is more practical.

After opening a hole (about three-fourths inch in diameter) in the main runway, drop the bait down the hole. Close the opening with sod or other material to cover with dirt to keep out all light and air. Determine the overall extent of the runway as closely as possible and place a bait near each end (this is where the pocket gopher will return to feed), and one or more baits in the central part of the system. A 40-acre field could be poisoned in three or four hours and the procedure should be repeated on two subsequent occasions to insure complete control.

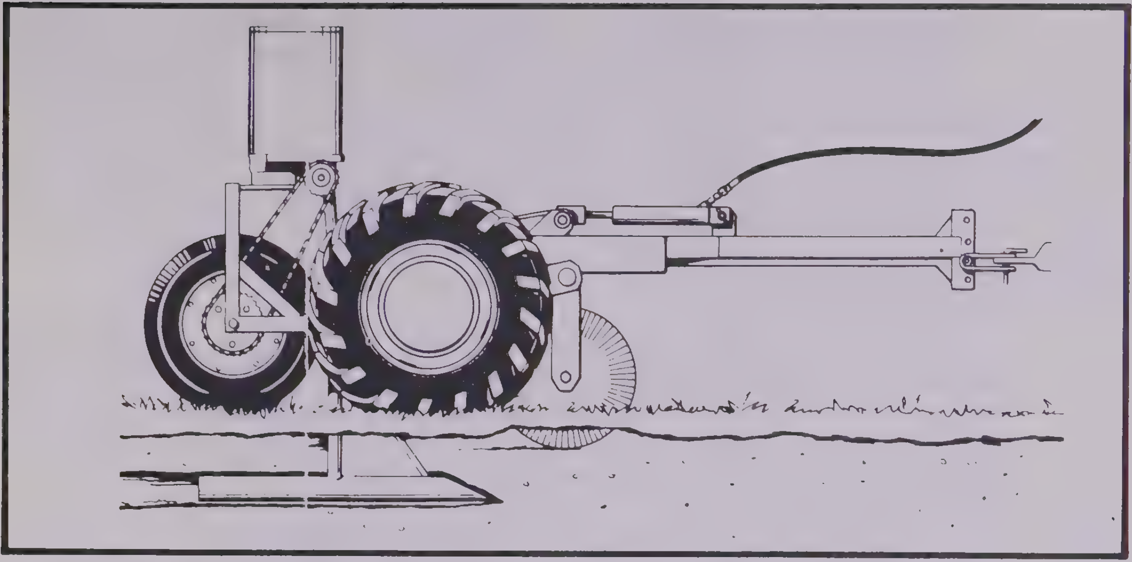


Fig. 13: The "burrow-builder" machine is an economical method of pocket gopher control on large acreages.

4. MACHINE BAITING:

Mechanical "burrow-builders" are being used with excellent results in large areas where it is uneconomical and too laborious to place baits by hand. These machines construct artificial burrows and seed them with poisoned bait in one operation. The artificial burrows intersect the natural runways of the gophers which are attracted to the bait by curiosity and a habit of investigating any disturbed soil.

The burrow-builder consists of a local tool carrier bar with a sub-soiler shank, a coulter disc and frame and a torpedo about three inches in diameter and 20 inches long at the end of the sub-soiler shank. The torpedo forms an artificial burrow as the burrow-builder is drawn across the field by a tractor. Close-set rubber tires behind the sub-soiler shank close the cut above the burrow. The poisoned bait is placed in a hopper with a metering device that feeds regulated amounts of bait into a tube which leads to an outlet at the rear of the torpedo.

The effectiveness of the burrow-builder depends upon

(a) proper adjustment of the machine, and
(b) suitability of the soil.

If the machine is not properly adjusted pocket gophers will consequently not be able to find the burrow if it is located too shallow or too deep. Any type of soil which is not reasonably moist and heavy does not lend itself to compaction and will not result in the formation of a "clean" artificial burrow. Success in areas where light sandy soils are prevalent is limited since the artificial burrow will immediately cave in. (Tests are being initiated by the Alberta Department of Agriculture to determine the effectiveness of a simple modification to the torpedo which may eliminate the problem of "cave-in".)

Artificial burrows cut at two different angles with 20 to 25 foot intervals across the field will intercept a maximum number of natural burrows, but will do very little damage to crops of alfalfa or grass. This treatment is most effective in spring and fall when the gophers are active at feeding and the soil is moist enough to hold its shape. One man can treat 10 acres per hour at a cost of about 25 to 35 cents per acre and approximately 80% kills can be expected in one operation. The planter plate and gear ratios should be adjusted to distribute 1-2 pounds of grain bait per acre.

Schneidermiller Industries, 334 East Mountain Street, Fort Collins, Colorado, U.S.A., manufacture a burrow-builder that can be used on any tractor with a standard three-point hitch. Elston Industries Ltd., 1350 Church Avenue, Winnipeg 14, Manitoba, Canada, produces two models, one with a single and one with a three-point hitch. These machines, which are listed in the $400-$500 price range, have been purchased by a number of counties in Alberta and are made available to farmers in the county on a rental basis.

5. POISON BAITS:

(a) Hand and Probe Baiting:

Cubed carrots with strychnine work well when properly placed in the burrow system. Cut enough carrots into chunks about 1-1/2 inches in length to fill a gallon jar. Add 1/4 ounce strychnine alkaloid powder, seal the lid tightly and shake the jar vigorously until all carrot pieces are thoroughly dusted. Use a sharp pointed instrument as a carrot skewer.

(b) Machine Bait Preparations:

Both gophacide (0.1%) and strychnine (0.4%) give good results (85% reduction in population) when used on oat (hulled) groats.

To prepare gophacide bait:

Although gophacide bait is now registered for use, it is not yet available from local suppliers. Attempts are being made to secure an interim supplier. It is anticipated a prepared gophacide bait will be available through the Alberta Department of Agriculture in the fall of 1970.

To prepare strychnine bait:

The suggested mixing rate is one 12 oz. tin of 8% liquid strychnine to 12 quarts or 15 pounds of oat groats. (Oat groats can be purchased locally from feed mills.) Mix thoroughly and allow to dry before machine application.

(c) It is Important to Note:

(1) That the bait material should be well impregnated with poison; bearing in mind that pocket gophers will meticulously clean and dry any moist or dirty bait before eating it.

(2) When using strychnine, use great caution not to inhale the dust.

(3) Do not leave any poison, the baits or mixing containers within the reach of children, livestock or pets. Label all containers "Poison".

(4) Care should be taken not to use poisons where field drainage could contaminate natural water systems.

(5) Toxic bait accidentally spilled in the field or elsewhere should be cleaned up thoroughly.

(6) Do not leave bait in hopper unattended, or where it can be obtained by children or irresponsible persons.

(7) Precautions should be taken to prevent spillage when the baiter is lifted out of the soil. This is especially true with the old models or with home-made baiters which have no shut-off device.

(8) Be sure to wash hands with soap and water after handling poison baits and before eating or smoking.

(d) Gophacide versus Strychnine:

Both compounds are equally effective. However, gophacide (also known as Bayer 38819 and DRC-714) is considerably safer because it is more selective for pocket gophers. Its slow action and the availability of good antidotes provide increased measures of safety. Pocket gophers (**Thomomys**, **Geomys** and **Cratogeomys** spp.), kangaroo rats (**Dipodomys ardii**), meadow mice (**Microtus** sp), pine voles (**Pitymyo pinetorium**) are all readily susceptible to gophacide. In general, ground squirrels are quite resistant and close relatives of ground squirrels such as the prairie dog, chipmunk and marmot are markedly resistant.

Although a few species of birds and animals are easily poisoned by consuming gophacide-contaminated carcasses — this danger is reduced because pocket gophers remain underground after baiting. This, plus the fact that all bait is placed underground, reduces the hazard to non-target species. Strychnine, on the other hand, is non-selective and is a potential hazard to a wide variety of non-target animal and bird species if not used properly.

(e) **Bait Storage:**

Treated bait is best stored at freezing temperatures to ensure future toxicity and taste acceptability.

(f) **Legislation regarding use of poisonous baits states:**

That strychnine in concentrations over 2% is prohibited from use in the province except under permit.

It is imperative that the regulations regarding handling, preparation, application and storage of pesticide, as outlined in the Agricultural Chemicals Act (April 1, 1970), be strictly adhered to. Please consult your local Agricultural officials for advice in this regard.

6. POISONOUS GASES:

The effectiveness of poison gas as a control for pocket gophers depends largely on soil type. Results of gaseous poisoning are best in heavy, moist soils which hold gases more readily than do lighter soils. Calcium cyanide and methyl bromide have been tested in Alberta with some success. **These gases are extremely poisonous to all warm-blooded animals and humans, and therefore must be used with great care.** Car exhaust gas is as effective and "safer" to use.

7. EXCLUSION:

Exclusion or keeping gophers out of a large area with chemical repellents or fences is not practical. However, there are special instances where it would be a good idea to protect newly-planted ornamental shrubs or flower gardens with a fence. Such a fence should be of small mesh wire or metal sunk below ground surface at least 12 inches.

8. REPELLENTS

Extensive damage to underground cables, telephone lines, etc., by pocket gophers, can be prevented by applying chemical repellents to the cables when buried. The most effective repellents are still undergoing tests and are not yet registered for general use in Canada.

9. NATURAL ENEMIES:

Horned owls, barn owls, long and short eared owls, rattlesnakes, bull snakes, coyotes, weasels, domestic cats, bobcats, badgers, skunks, foxes, and some hawks (i.e. Swainson's and Red Tailed Hawks) feed on pocket gophers. **Every gopher eaten by these predators means one less for the farmer to destroy.**

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